





L1-

level GTL

long track reconstruction

Neutral hadron identification

MUON Sub-trigger

A 3D track reconstruction algorithm for the pre-research of STCF MDC L1 trigger

 Super τ-Charm Facility (STCF) XY 2D tracking and reconstruction A new generation of high-luminosity electron-positron collider CME: 2-7 GeV MDC Sub-trigger **3D** reconstruction Peak luminosity: >0.5×10³⁵ cm⁻²s⁻¹ at 4 GeV Time reconstruction High luminosity generates: Cluster reconstruction and pattern analysis High physics event rate: over **400 kHz** ٠ ECAL Sub-trigger Energy and balance analysis High background: ~ 400 kHz/channel in MDC Event time reconstruction Good background suppression capability **DTOF** Sub-trigger Trigger & time reconstruction

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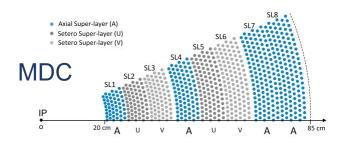
Low latency





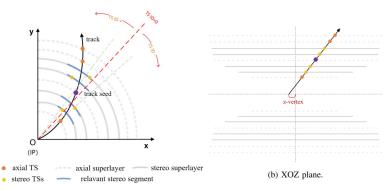


Preprocessing



Track segment (TS) finding

2D reconstruction (axial layer TSs and $p_t)$ & stereo TSs matching



(a) XOY plane.

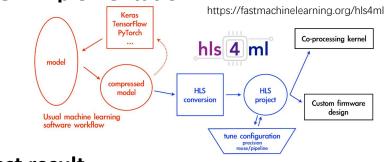
3D track reconstruction algorithm

MLP training

24 input: TS ID & TDC timing of 12 TSs 1 output: z-vertex estimation

Qkeras---quantization aware training **Pruning**---reduce model's size

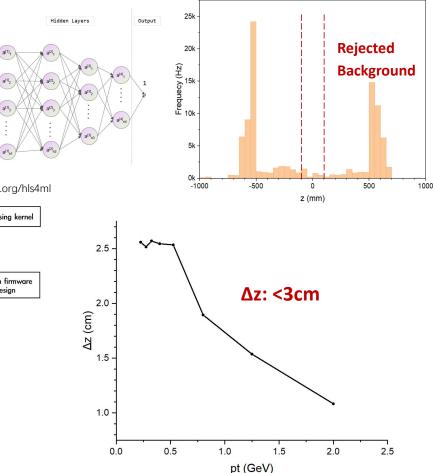
FPGA implementation



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Test result

Test data set: 100k clear single tracks MLP structure: 24-48-32-16-8-1 Sparsity: 0.4 CLK: 400MHz FPGA: XCKU060 Dead time: 4 clks Latency: 30clks



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